

FCC Radio Test Report

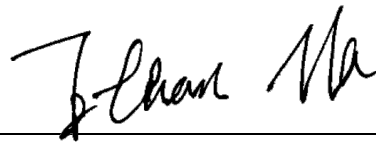
FCC ID: QISME919BS-567BNB

This report concerns: Original Grant

Project No. : 1907C062
Equipment : LTE Module
Test Model : ME919Bs-567bNb
Series Model : N/A
Applicant : Huawei Technologies Co., Ltd.
Address : Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, China


Date of Receipt : Jul. 08, 2019
Date of Test : Jul. 09, 2019 ~ Jul. 22, 2019
Issued Date : Jul. 23, 2019
Tested by : BTL Inc.

Technical Manager :



(Ethan Ma)

Authorized Signatory :



(Steven Lu)

B T L I N C .

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Certificate #5123.02

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The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and is not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Jul. 23, 2019

1. GENERAL SUMMARY

Equipment : LTE Module
Brand Name : HUAWEI
Test Model : ME919Bs-567bNb
Series Model : N/A
Applicant : Huawei Technologies Co., Ltd.
Manufacturer : Huawei Technologies Co., Ltd.
Address : Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
Bantian, Longgang District, Shenzhen, 518129, China
Factory : Huawei Technologies Co., Ltd.
Address : Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
Bantian, Longgang District, Shenzhen, 518129, China
Date of Test : Jul. 09, 2019 ~ Jul. 22, 2019
Test Sample : Engineering Sample No.: DG190708164 for conducted, DG190708163 for
radiated.
Standard(s) : 47 CFR FCC Part 22 Subpart H
47 CFR FCC Part 2
ANSI/TIA/EIA-603-E-2016
FCC KDB 971168 D01 Power Meas License Digital Systems v03r01

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1907C062) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of A2LA according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

Test results included in this report are only for the GSM850, WCDMA Band V and LTE Band 5 part.

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part 22 Subpart H & Part 2			
Standard(s) Section	Test Item	Verdict	Tested By
2.1046 22.913(a)	Effective Radiated Power	PASS	Paul Li
2.1049	Occupied Bandwidth	PASS	Paul Li
2.1051 22.917(a)	Conducted Spurious Emissions	PASS	Paul Li
2.1053 22.917(a)	Radiated Spurious Emissions	PASS	Paul Li
22.917(a)	Band Edge Measurements	PASS	Paul Li
-	Peak To Average Ratio	PASS	Paul Li
2.1055 22.355	Frequency Stability	PASS	Paul Li

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

BTL's Test Firm Registration Number for FCC: 357015

BTL's Designation Number for FCC: CN1240

2.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty figures shall be calculated according the methods described in the ETSI TR 100 028 and shall correspond to an expansion factor (coverage factor) $k=1.96$ or $k=2$ (which provide confidence levels of respectively 90% and 95.45% in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Measurement Uncertainty for a Level of Confidence of 95 %, $U=2xUc(y)$.

The BTL measurement uncertainty as below table:

A. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
DG-CB03 (3m)	CISPR	9KHz ~ 30MHz	V	3.79
		9KHz ~ 30MHz	H	3.57
		30MHz ~ 200MHz	V	4.88
		30MHz ~ 200MHz	H	4.14
		200MHz ~ 1,000MHz	V	4.62
		200MHz ~ 1,000MHz	H	4.80

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB03 (3m)	CISPR	1GHz ~ 6GHz	4.58
		6GHz ~ 18GHz	5.18

Test Site	Method	Measurement Frequency Range	U,(dB)
DG-CB03 (1m)	CISPR	18 ~ 26.5 GHz	3.80
		26.5 ~ 40 GHz	4.30

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	LTE Module	
Brand Name	HUAWEI	
Test Model	ME919Bs-567bNb	
Series Model	N/A	
Model Difference(s)	N/A	
Hardware Version	RM3ME919BSM34	
Software Version	11.789.07.05.1400	
Antenna Type	Internal Antenna	
Antenna Gain	GSM850	2.5 dBi
	WCDMA V	
	LTE Band 5	
Modulation Type	GSM/GPRS	GMSK
	EDGE	GMSK, 8PSK
	WCDMA	UL: QPSK DL: QPSK, 16QAM
	WCDMA(HSDPA/HSUPA)	16QAM
	LTE	UL: QPSK, 16QAM DL: QPSK, 16QAM, 64QAM
Operation Frequency	GSM /EDGE/GPRS	824.2MHz ~ 848.8MHz
	WCDMA Band V	826.4MHz ~ 846.6MHz
	LTE Band 5 (Channel Bandwidth: 1.4MHz)	824.7 MHz ~ 848.3 MHz
	LTE Band 5 (Channel Bandwidth: 3MHz)	825.5 MHz ~ 847.5 MHz
	LTE Band 5 (Channel Bandwidth: 5MHz)	826.5 MHz ~ 846.5 MHz
	LTE Band 5 (Channel Bandwidth: 10MHz)	829.0 MHz ~ 844.0 MHz

Max. ERP Power	GSM/GPRS	GMSK	32.66	dBm
	EDGE	8PSK	27.53	dBm
	WCDMA	QPSK	23.89	dBm
	WCDMA_HSDPA	16QAM	23.89	dBm
	WCDMA_HSUPA	16QAM	23.84	dBm
	LTE Band 5 (Channel Bandwidth: 1.4MHz)	QPSK	22.89	dBm
		16QAM	22.18	dBm
	LTE Band 5 (Channel Bandwidth: 3MHz)	QPSK	23.01	dBm
		16QAM	22.46	dBm
	LTE Band 5 (Channel Bandwidth: 5MHz)	QPSK	23.52	dBm
		16QAM	22.76	dBm
	LTE Band 5 (Channel Bandwidth: 10MHz)	QPSK	23.08	dBm
16QAM		22.72	dBm	
Power Source	DC Voltage supplied from AC/DC adapter (support unit).			
Power Rating	I/P: 100-240V ~50/60Hz O/P: 12V === 1.5A EUT: 4V ===			

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

3.2 DESCRIPTION OF TEST MODES AND TEST CONDITION

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports
 The worst case was found when positioned on X-plane for EIRP and X-axis for radiated emission.
 Following channel(s) was (were) selected for the final test as listed below:

GSM MODE			
Test Item	Available Channel	Tested Channel	Mode
ERP	128 to 251	128, 190, 251	GSM, GPRS, EDGE
Output Power	128 to 251	128, 190, 251	GSM, GPRS, EDGE
Occupied Bandwidth	128 to 251	128, 190, 251	GSM, EDGE
Conducuted Emission	128 to 251	190	GSM, EDGE
Radiated Emission	128 to 251	190	GSM, EDGE
Band Edge	128 to 251	128, 251	GSM, EDGE
Peak to Average Ratio	128 to 251	128, 190, 251	GSM, EDGE
Frequency Stability	128 to 251	190	GSM

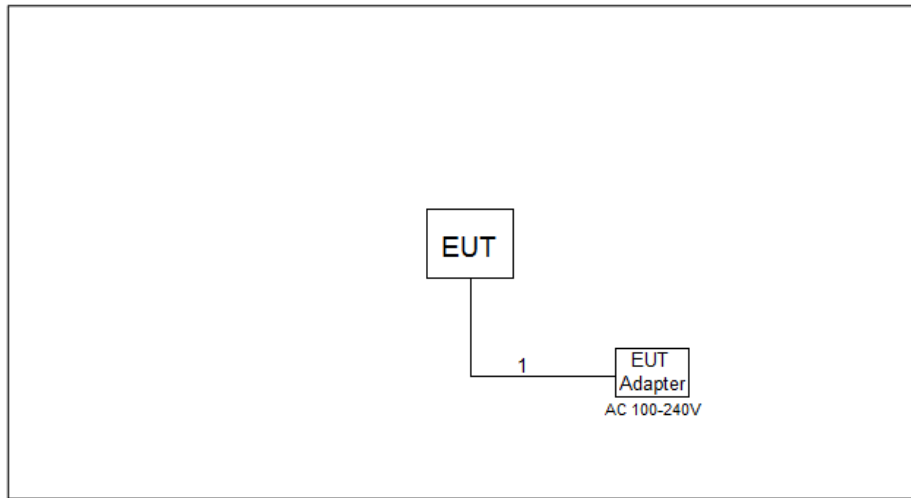
WCDMA MODE			
Test Item	Available Channel	Tested Channel	Mode
ERP	4132 to 4233	4132, 4182, 4233	WCDMA, HSDPA, HSUPA
Output Power	4132 to 4233	4132, 4182, 4233	WCDMA, HSDPA, HSUPA
Conducted Emission	4132 to 4233	4182	WCDMA
Radiated Emission	4132 to 4233	4182	WCDMA
Band Edge	4132 to 4233	4132, 4233	WCDMA, HSDPA, HSUPA
Peak to Average Ratio	4132 to 4233	4132, 4182, 4233	WCDMA, HSDPA, HSUPA
Frequency Stability	4132 to 4233	4182	WCDMA

LTE BAND 5						
Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode	
Output Power & ERP	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK, 16QAM	1RB/3RB/6RB	
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK, 16QAM	1RB/8RB/15RB	
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK, 16QAM	1RB/12RB/25RB	
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK, 16QAM	1RB/25RB/50RB	
Occupied Bandwidth	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK, 16QAM	6 RB	
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK, 16QAM	15 RB	
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK, 16QAM	25 RB	
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK, 16QAM	50 RB	
Conducted Emission	20407 to 20643	20525	1.4MHz	QPSK	1 RB	
	20425 to 20625	20525	5MHz	QPSK	1 RB	
	20450 to 20600	20525	10MHz	QPSK	1 RB	
Radiated Emission	20407 to 20643	20525	1.4MHz	QPSK	1 RB	
	20425 to 20625	20525	5MHz	QPSK	1 RB	
	20450 to 20600	20525	10MHz	QPSK	1 RB	
Band Edge	20407 to 20643	20407	1.4MHz	QPSK	1 RB	
		20643	1.4MHz	QPSK	6 RB	
	20415 to 20635	20415	3MHz	QPSK	1 RB	
		20635	3MHz	QPSK	15 RB	
	20425 to 20625	20425	5MHz	QPSK	1 RB	
		20625	5MHz	QPSK	25 RB	
	20450 to 20600	20450	10MHz	QPSK	1 RB	
		20600	10MHz	QPSK	50 RB	
	Peak To Average Ratio	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK, 16QAM	1 RB
		20415 to 20635	20415, 20525, 20635	3MHz	QPSK, 16QAM	1 RB
		20425 to 20625	20425, 20525, 20625	5MHz	QPSK, 16QAM	1 RB
		20450 to 20600	20450, 20525, 20600	10MHz	QPSK, 16QAM	1 RB
Frequency Stability	20407 to 20643	20525	1.4MHz	QPSK	1 RB	
	20415 to 20635	20525	3MHz	QPSK	1 RB	
	20425 to 20625	20525	5MHz	QPSK	1 RB	
	20450 to 20600	20525	10MHz	QPSK	1 RB	

EUT TEST CONDITIONS:

Test Item	Environmental Conditions	Test Voltage
ERP	24.5°C, 49.5%RH	DC 4.0V
Output Power	24.5°C, 49.5%RH	DC 4.0V
Occupied Bandwidth	24.5°C, 49.5%RH	DC 4.0V
Conducted Emission	24.5°C, 49.5%RH	DC 4.0V
Radiated Emission	24°C, 68%RH	AC 120V/60Hz
Band Edge	24.5°C, 49.5%RH	DC 4.0V
Peak to Average Ratio	24.5°C, 49.5%RH	DC 4.0V
Frequency Stability	Normal and Extreme	Normal and Extreme

3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
-	-	-	-	-

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	1.2m

4. TEST RESULT

4.1 OUTPUT POWER MEASUREMENT

4.1.1 LIMIT

Mobile / Portable station are limited to 7 watts e.r.p.

4.1.2 TEST PROCEDURE

EIRP/ ERP:

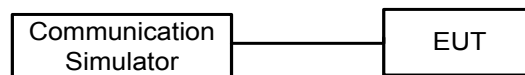
1. EIRP= Output Power +Antenan gain
ERP power= EIPR power-2.15dBi.

Output Power:

The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 TEST SETUP LAYOUT

Output Power Measurement



4.1.4 TEST DEVIATION

No deviation

4.1.5 TEST RESULTS

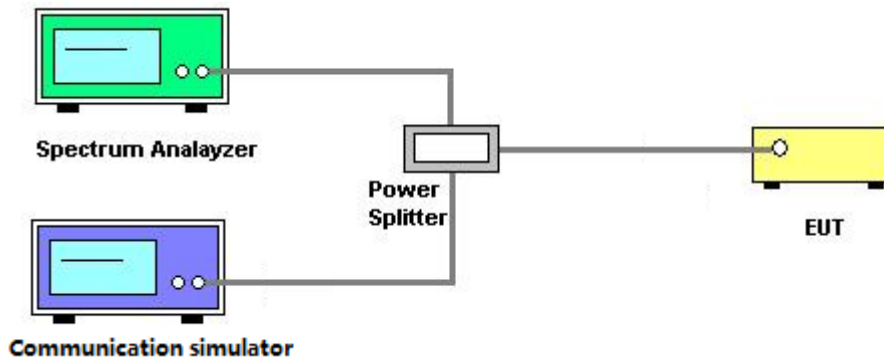
Please refer to the Appendix A.

4.2 OCCUPIED BANDWIDTH MEASUREMENT

4.2.1 TEST PROCEDURE

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth and 26dB bandwidth.

4.2.2 TEST SETUP LAYOUT



4.2.3 TEST DEVIATION

No deviation

4.2.4 TEST RESULTS

Please refer to the Appendix B.

4.3 CONDUCTED EMISSIONS MEASUREMENT

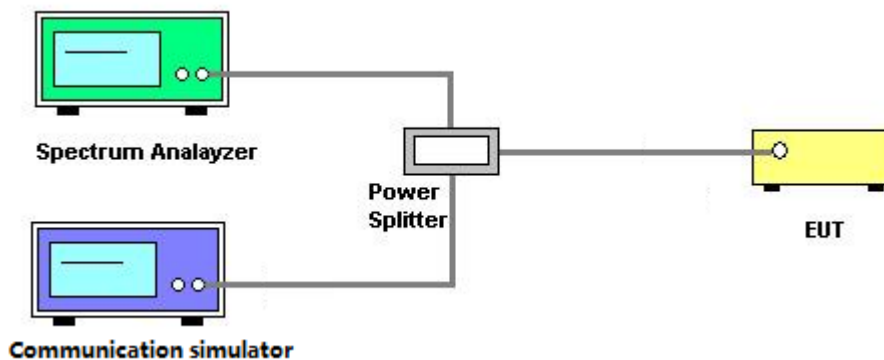
4.3.1 LIMIT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13dBm.

4.3.2 TEST PROCEDURES

1. The testing follows FCC KDB 971168 v03r01 Section 6.0.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured. Set $RBW \geq 1\%$ EBW in the 1MHz band immediately outside and adjacent to the band edge.
4. Set spectrum analyzer with RMS detector.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

4.3.3 TEST SETUP LAYOUT



4.3.4 TEST DEVIATION

No deviation

4.3.5 TEST RESULTS

Please refer to the Appendix C.

4.4 RADIATED EMISSIONS MEASUREMENT

4.4.1 LIMIT

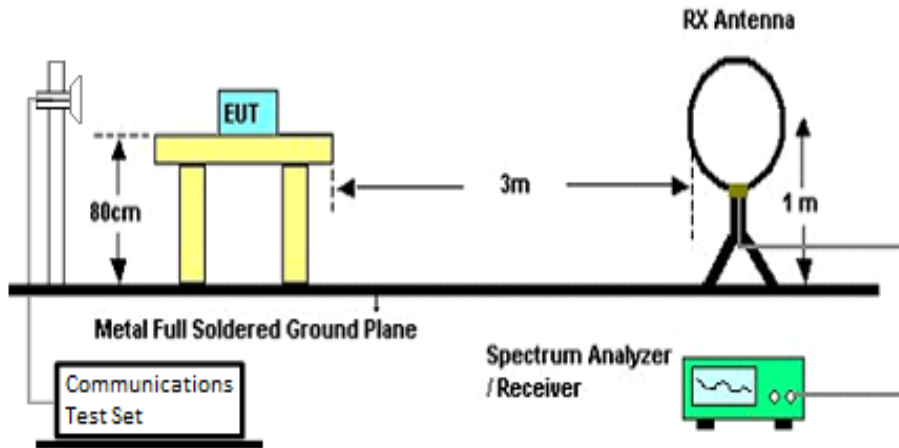
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13dBm.

4.4.2 TEST PROCEDURES

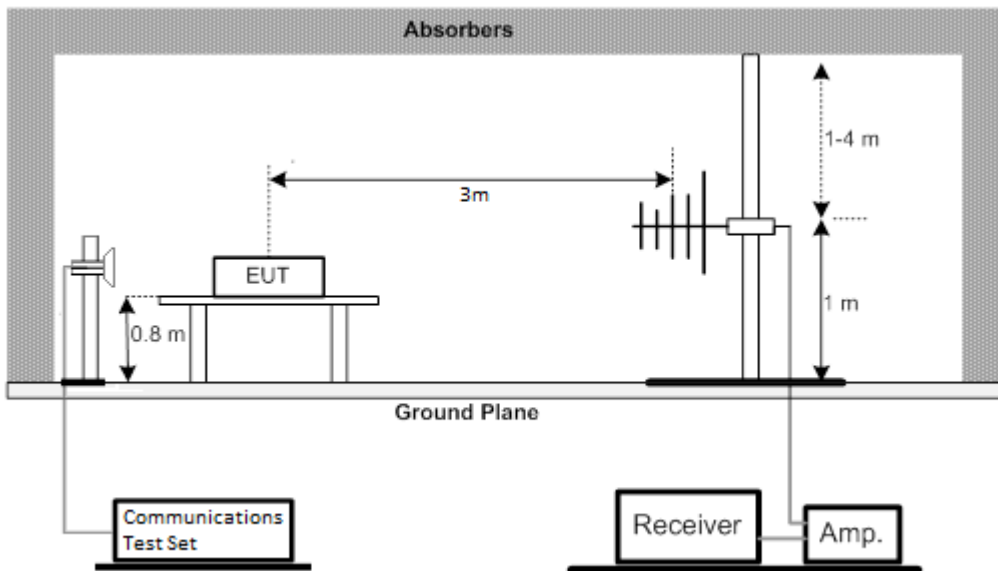
1. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
2. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value " of step a. Record the power level of S.G
3. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
4. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

4.4.3 TEST SETUP LAYOUT

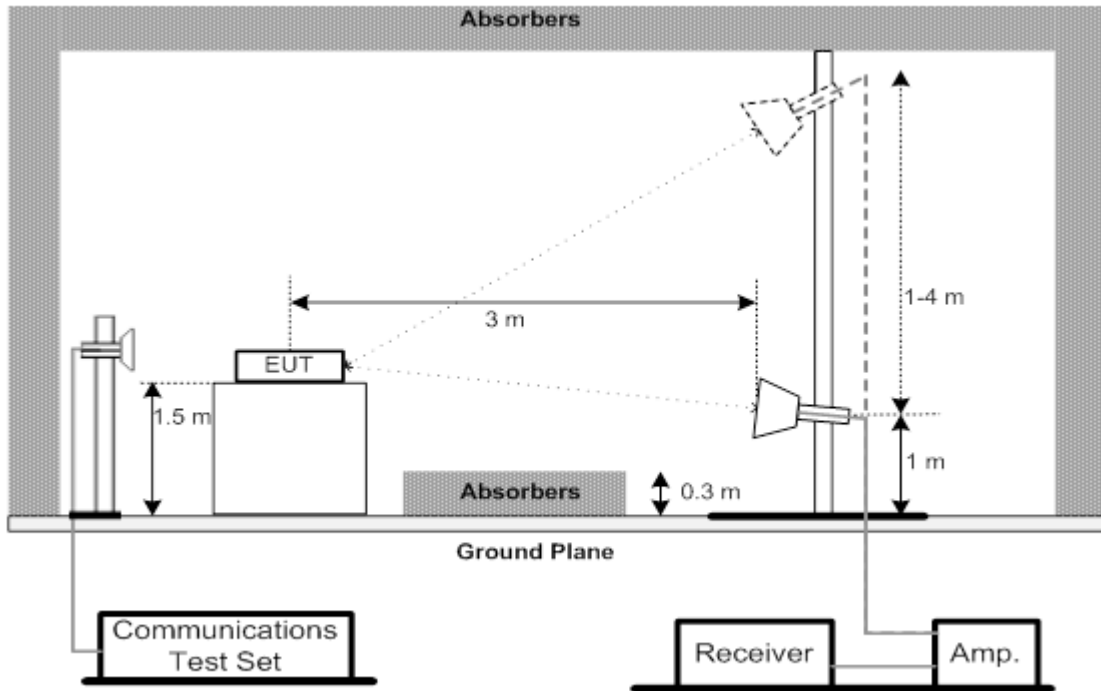
Below 30MHz



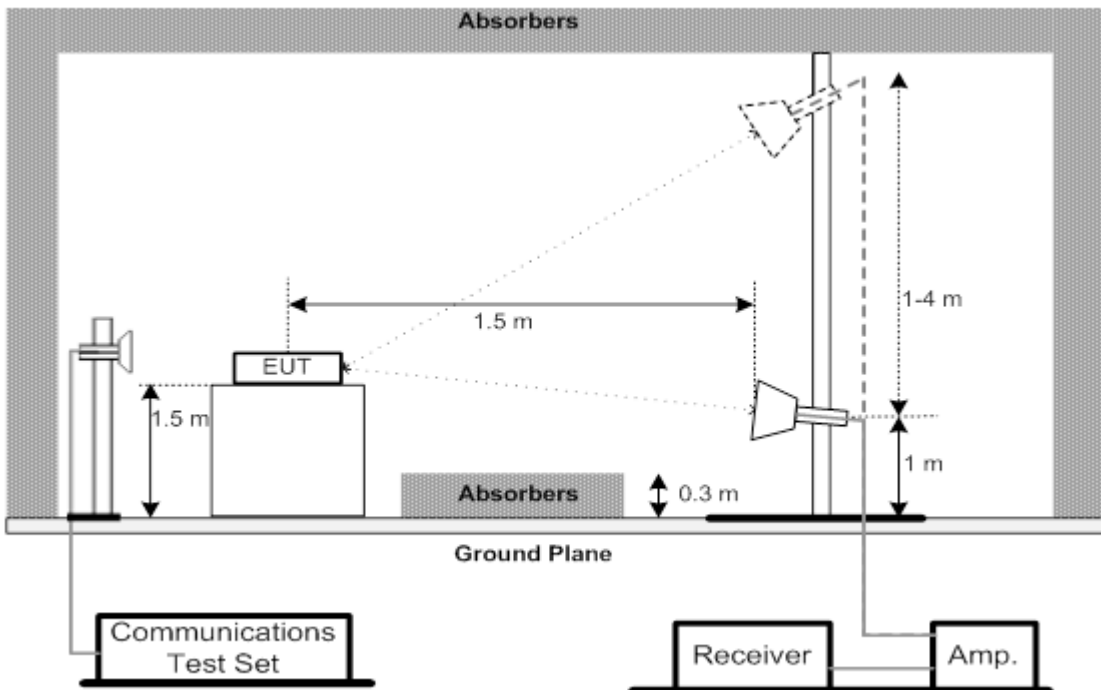
30MHz to 1GHz



1GHz to 18GHz



Above 18GHz



4.4.4 TEST DEVIATION

No deviation

4.4.5 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the Appendix D.

4.4.6 TEST RESULTS (30MHZ TO 1000MHZ)

Please refer to the Appendix E.

4.4.7 TEST RESULTS (ABOVE 1000MHZ)

Please refer to the Appendix F.

4.5 BAND EDGE MEASUREMENT

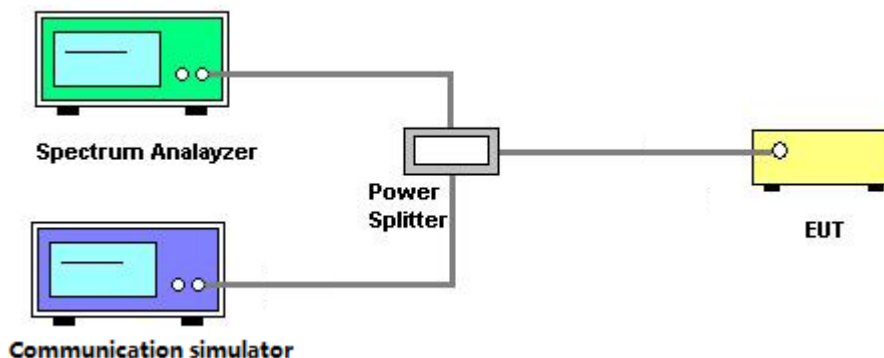
4.5.1 LIMIT

A Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

4.5.2 TEST PROCEDURES

1. All measurements were done at low and high operational frequency range.
2. The center frequency of spectrum is the band edge frequency and span is 1.5MHz. RB of the spectrum is 3kHz and VB of the spectrum is 10kHz (GSM/GPRS/EDGE).
3. The center frequency of spectrum is the band edge frequency and span is 10MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (WCDMA).
4. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 15kHz and VB of the spectrum is 43kHz (LTE Bandwidth 1.4MHz).
5. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 30kHz and VB of the spectrum is 91kHz (LTE Bandwidth 3MHz).
6. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 51kHz and VB of the spectrum is 150kHz (LTE Bandwidth 5MHz).
7. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (LTE Bandwidth 10MHz).
8. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 150kHz and VB of the spectrum is 470kHz (LTE Bandwidth 15MHz).
9. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 200kHz and VB of the spectrum is 620kHz (LTE Bandwidth 20MHz).

4.5.3 TEST SETUP LAYOUT



4.5.4 TEST DEVIATION

No deviation

4.5.5 TEST RESULTS

Please refer to the Appendix G.

4.6 PEAK TO AVERAGE RATIO MEASUREMENT

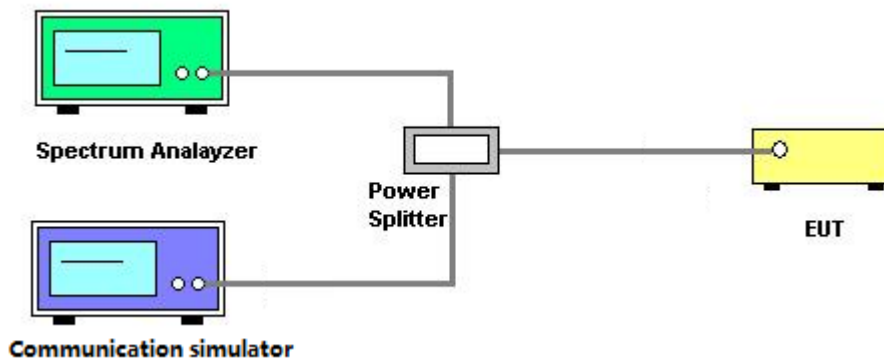
4.6.1 LIMIT

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

4.6.2 TEST PROCEDURES

1. Set resolution/measurement bandwidth \geq signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

4.6.3 TEST SETUP LAYOUT



4.6.4 TEST DEVIATION

No deviation

4.6.5 TEST RESULTS

Please refer to the Appendix H.

4.7 FREQUENCY STABILITY MEASUREMENT

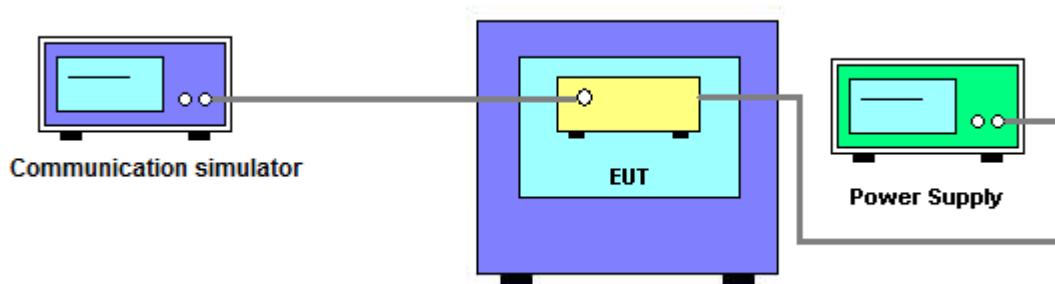
4.7.1 LIMIT

± 1.5 ppm is for base and fixed station. ± 2.5 ppm is for mobile station.

4.7.2 TEST PROCEDURES

1. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
2. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
3. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the $\pm 0.5^{\circ}\text{C}$ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.
4. The frequency error was recorded frequency error from the communication simulator.

4.7.3 TEST SETUP LAYOUT



4.7.4 TEST DEVIATION

No deviation

4.7.5 TEST RESULTS

Please refer to the Appendix I.

5. LIST OF MEASUREMENT EQUIPMENTS

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 09, 2020
2	Amplifier	Agilent	8449B	3008A02274	Mar. 10, 2020
3	Amplifier	HP	8447D	2944A09673	Aug. 11, 2019
4	HighPass Filter	Wairwright Instruments Gmbh	WHK 1.5/15G-10ST	11	Mar. 10, 2020
5	Band Reject Filter	Wairwright Instruments Gmbh	WRCG 1710/1785-1690/180 5-60/12SS	38	Mar. 10, 2020
6	Band Reject Filter	Wairwright Instruments Gmbh	WRCG 824/849-810/863-60/ 9SS	7	Mar. 10, 2020
7	Band Reject Filter	Wairwright Instruments Gmbh	WRCG 880/915-860/935-60/ 9SS	14	Mar. 10, 2020
8	Band Reject Filter	Wairwright Instruments Gmbh	WRCG 1850/1910-1830/193 0-60/10SS	17	Mar. 10, 2020
9	HighPass Filter	Wairwright Instruments Gmbh	WHK3.1/18G-10SS	24	Mar. 10, 2020
10	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Mar. 10, 2020
11	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 10, 2020
12	Receiver	Agilent	N9038A	MY52130039	Aug. 11, 2019
13	wideband radio communication tester	R&S	CMW500	152372	Mar. 10, 2020
14	High pass filter	KANGMAIWEI	ZHPF-M3-12.75G-38 69	B2015073763	Feb. 12, 2020
15	High pass filter	KANGMAIWEI	ZHPF-M1000-4000-1	B2015073762	Feb. 12, 2020
16	High pass filter	KANGMAIWEI	ZHPF-M6-186-1727	B2015073764	Feb. 12, 2020
17	Cable	emci	LMR-400(30MHz-1G Hz)(8m+5m)	N/A	May 24, 2020
18	Cable	mitron	B10-01-01-12M	18072744	Jul. 30, 2019
19	Controller	ETS-Lindgren	2090	N/A	N/A
20	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
21	Loop Antenna	EM	EM-6876-1	230	Jan. 15, 2020
22	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 09, 2020
23	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 23, 2020

Conducted Emission & Band Edge & Occupied Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Mar. 10, 2020
2	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 10, 2020
3	POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	331000910-1	Mar. 10, 2020
4	wideband radio communication tester	R&S	CMW500	152372	Mar. 10, 2020
5	Spectrum Analyzer	R&S	FSP40	100185	Aug. 11, 2019

Frequency Stability Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Mar. 10, 2020
2*	Multi-output DC Power Supply	GW Instek	GPC-3030DN	EK880675	Sep. 26, 2020
3	POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	331000910-1	Mar. 10, 2020
4	wideband radio communication tester	R&S	CMW500	152372	Mar. 10, 2020
5	Const Temp,& Humidity Chamber	Bell	BTH-50C	20170306001	Mar. 10, 2020

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

* All calibration period of equipment list is three year.

APPENDIX A - OUTPUT POWER

Output Power (dBm):

GSM850		Burst Output Power		
		128CH	190CH	251CH
		824.2MHz	836.6MHz	848.8MHz
GSM (CS)		32.19	32.28	32.31
GPRS/EDGE (GMSK)	1 Tx Slot	32.19	32.29	32.31
	2 Tx Slot	29.9	29.95	29.98
	3 Tx Slot	28.75	28.86	28.83
	4 Tx Slot	26.78	26.76	26.82
EDGE (8PSK)	1 Tx Slot	27.07	27.18	27.12
	2 Tx Slot	24.44	24.35	24.34
	3 Tx Slot	23.37	23.32	23.36
	4 Tx Slot	21.15	21.32	21.35

Modulation	Band	WCDMA V		
	Tx Channel	4132CH	4182CH	4233CH
	Frequency	826.4MHz	836.4MHz	846.6MHz
QPSK	RMC 12.2K	23.37	23.45	23.52
	RMC 64K	23.31	23.39	23.52
	RMC 144K	23.29	23.45	23.54
	RMC 384K	23.36	23.42	23.47
16QAM	HSDPA Subtest-1	23.38	23.49	23.53
	HSDPA Subtest-2	23.37	23.51	23.53
	HSDPA Subtest-3	23.3	23.49	23.54
	HSDPA Subtest-4	23.35	23.47	23.51
	HSUPA Subtest-1	22.12	22.25	22.29
	HSUPA Subtest-2	21.27	21.37	21.51
	HSUPA Subtest-3	21.51	21.23	21.65
	HSUPA Subtest-4	21.31	21.48	21.54
	HSUPA Subtest-5	23.34	23.42	23.49

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20407CH	20525CH	20643CH
				824.7MHz	836.5MHz	848.3MHz
5 / 1.4M	QPSK	1	0	22.39	22.27	22.32
		1	2	22.51	22.46	22.34
		1	5	22.43	22.34	22.00
		3	0	22.54	22.33	22.31
		3	1	22.52	22.37	22.27
		3	2	22.53	22.38	22.20
		6	0	22.15	22.01	21.87
	16QAM	1	0	21.74	21.63	21.57
		1	2	21.83	21.78	21.58
		1	5	21.79	21.72	21.25
		3	0	21.75	21.53	21.49
		3	1	21.74	21.57	21.46
		3	2	21.76	21.60	21.38
		6	0	21.58	21.18	21.17

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20415CH	20525CH	20635CH
				825.5MHz	836.5MHz	847.5MHz
5 / 3M	QPSK	1	0	22.38	22.11	22.37
		1	7	22.66	22.50	22.57
		1	14	22.34	22.17	21.85
		8	0	22.12	21.83	21.98
		8	4	22.23	22.02	21.98
		8	7	22.17	22.05	21.91
		15	0	22.15	21.99	21.92
	16QAM	1	0	21.68	21.45	21.55
		1	7	22.11	21.84	21.74
		1	14	21.88	21.58	21.00
		8	0	21.52	21.15	21.19
		8	4	21.62	21.29	21.26
		8	7	21.60	21.32	21.13
		15	0	21.58	21.24	21.09

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20425CH	20525CH	20625CH
				826.5MHz	836.5MHz	846.5MHz
5 / 5M	QPSK	1	0	22.78	22.37	22.87
		1	13	22.64	22.36	22.42
		1	24	23.17	22.79	22.22
		12	0	22.10	21.72	22.05
		12	6	22.22	21.97	22.01
		12	11	22.20	22.00	21.89
		25	0	22.16	21.84	21.88
	16QAM	1	0	21.96	21.86	22.41
		1	13	21.96	21.84	21.94
		1	24	22.04	22.21	21.76
		12	0	21.42	20.98	21.26
		12	6	21.52	21.22	21.18
		12	11	21.43	21.25	21.13
		25	0	21.44	21.05	21.08

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20450CH	20525CH	20600CH
				829.0MHz	836.5MHz	844.0MHz
5 / 10M	QPSK	1	0	22.58	22.29	22.16
		1	25	22.48	22.34	22.73
		1	49	22.12	22.29	22.29
		25	0	21.98	21.53	22.15
		25	13	21.97	21.77	22.02
		25	25	21.58	21.76	21.69
		50	0	21.83	21.83	21.81
	16QAM	1	0	22.06	21.74	21.83
		1	25	21.85	21.78	21.92
		1	49	21.61	22.37	21.46
		25	0	21.20	20.77	21.38
		25	13	21.19	21.03	21.21
		25	25	20.81	20.99	20.88
		50	0	21.03	21.07	20.93

ERP Power (dBm):

GSM850		ERP Power		
		128CH	190CH	251CH
		824.2MHz	836.6MHz	848.8MHz
GSM (CS)		32.54	32.63	32.66
GPRS/EDGE (GMSK)	1 Tx Slot	32.54	32.64	32.66
	2 Tx Slot	30.25	30.30	30.33
	3 Tx Slot	29.10	29.21	29.18
	4 Tx Slot	27.13	27.11	27.17
EDGE (8PSK)	1 Tx Slot	27.42	27.53	27.47
	2 Tx Slot	24.79	24.70	24.69
	3 Tx Slot	23.72	23.67	23.71
	4 Tx Slot	21.50	21.67	21.70

Modulation	Band	WCDMA V		
	Tx Channel	4132CH	4182CH	4233CH
	Frequency	826.4MHz	836.4MHz	846.6MHz
QPSK	RMC 12.2K	23.72	23.80	23.87
	RMC 64K	23.66	23.74	23.87
	RMC 144K	23.64	23.80	23.89
	RMC 384K	23.71	23.77	23.82
16QAM	HSDPA Subtest-1	23.73	23.84	23.88
	HSDPA Subtest-2	23.72	23.86	23.88
	HSDPA Subtest-3	23.65	23.84	23.89
	HSDPA Subtest-4	23.70	23.82	23.86
	HSUPA Subtest-1	22.47	22.60	22.64
	HSUPA Subtest-2	21.62	21.72	21.86
	HSUPA Subtest-3	21.86	21.58	22.00
	HSUPA Subtest-4	21.66	21.83	21.89
HSUPA Subtest-5	23.69	23.77	23.84	

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20407CH	20525CH	20643CH
				824.7MHz	836.5MHz	848.3MHz
5 / 1.4M	QPSK	1	0	22.74	22.62	22.67
		1	2	22.86	22.81	22.69
		1	5	22.78	22.69	22.35
		3	0	22.89	22.68	22.66
		3	1	22.87	22.72	22.62
		3	2	22.88	22.73	22.55
		6	0	22.50	22.36	22.22
	16QAM	1	0	22.09	21.98	21.92
		1	2	22.18	22.13	21.93
		1	5	22.14	22.07	21.60
		3	0	22.10	21.88	21.84
		3	1	22.09	21.92	21.81
		3	2	22.11	21.95	21.73
		6	0	21.93	21.53	21.52

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20415CH	20525CH	20635CH
				825.5MHz	836.5MHz	847.5MHz
5 / 3M	QPSK	1	0	22.73	22.46	22.72
		1	7	23.01	22.85	22.92
		1	14	22.69	22.52	22.20
		8	0	22.47	22.18	22.33
		8	4	22.58	22.37	22.33
		8	7	22.52	22.40	22.26
		15	0	22.50	22.34	22.27
	16QAM	1	0	22.03	21.80	21.90
		1	7	22.46	22.19	22.09
		1	14	22.23	21.93	21.35
		8	0	21.87	21.50	21.54
		8	4	21.97	21.64	21.61
		8	7	21.95	21.67	21.48
		15	0	21.93	21.59	21.44

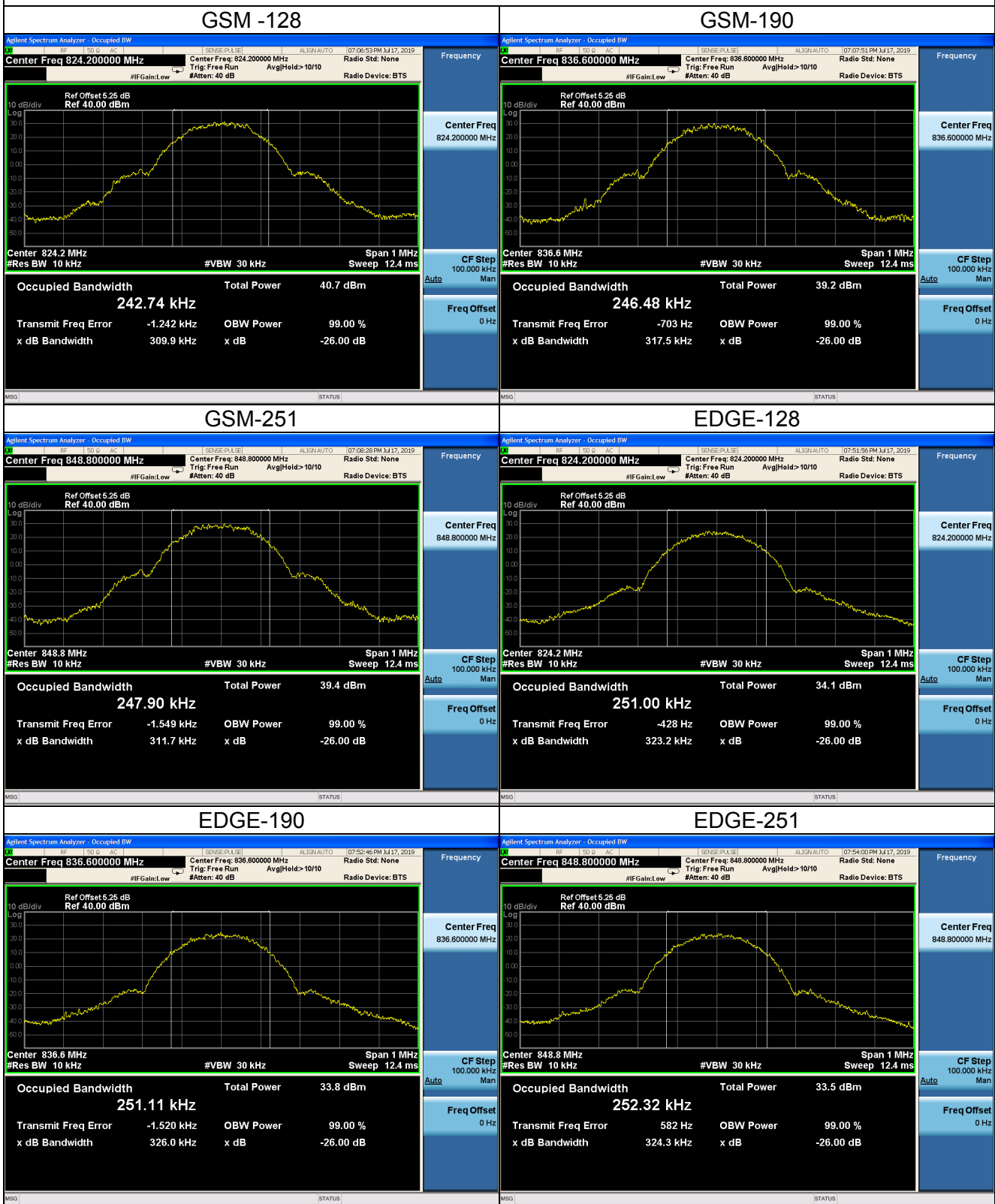
LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20425CH	20525CH	20625CH
				826.5MHz	836.5MHz	846.5MHz
5 / 5M	QPSK	1	0	23.13	22.72	23.22
		1	13	22.99	22.71	22.77
		1	24	23.52	23.14	22.57
		12	0	22.45	22.07	22.40
		12	6	22.57	22.32	22.36
		12	11	22.55	22.35	22.24
	16QAM	25	0	22.51	22.19	22.23
		1	0	22.31	22.21	22.76
		1	13	22.31	22.19	22.29
		1	24	22.39	22.56	22.11
		12	0	21.77	21.33	21.61
		12	6	21.87	21.57	21.53
		12	11	21.78	21.60	21.48
		25	0	21.79	21.40	21.43

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20450CH	20525CH	20600CH
				829.0MHz	836.5MHz	844.0MHz
5 / 10M	QPSK	1	0	22.93	22.64	22.51
		1	25	22.83	22.69	23.08
		1	49	22.47	22.64	22.64
		25	0	22.33	21.88	22.50
		25	13	22.32	22.12	22.37
		25	25	21.93	22.11	22.04
		50	0	22.18	22.18	22.16
	16QAM	1	0	22.41	22.09	22.18
		1	25	22.20	22.13	22.27
		1	49	21.96	22.72	21.81
		25	0	21.55	21.12	21.73
		25	13	21.54	21.38	21.56
		25	25	21.16	21.34	21.23
		50	0	21.38	21.42	21.28

APPENDIX B - OCCUPIED BANDWIDTH

GSM850					
GSM			EDGE		
CS			8PSK		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
128	824.2	0.2427	128	824.2	0.2510
190	836.6	0.2465	190	836.6	0.2511
251	848.8	0.2479	251	848.8	0.2523
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
128	824.2	0.3099	128	824.2	0.3232
190	836.6	0.3175	190	836.6	0.3260
251	848.8	0.3117	251	848.8	0.3243

Spectrum Plot



WCDMA Band V					
QPSK					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
4132	826.4	4.1268	4132	826.4	4.706
4182	836.4	4.1650	4182	836.4	4.729
4233	846.6	4.1188	4233	846.6	4.685

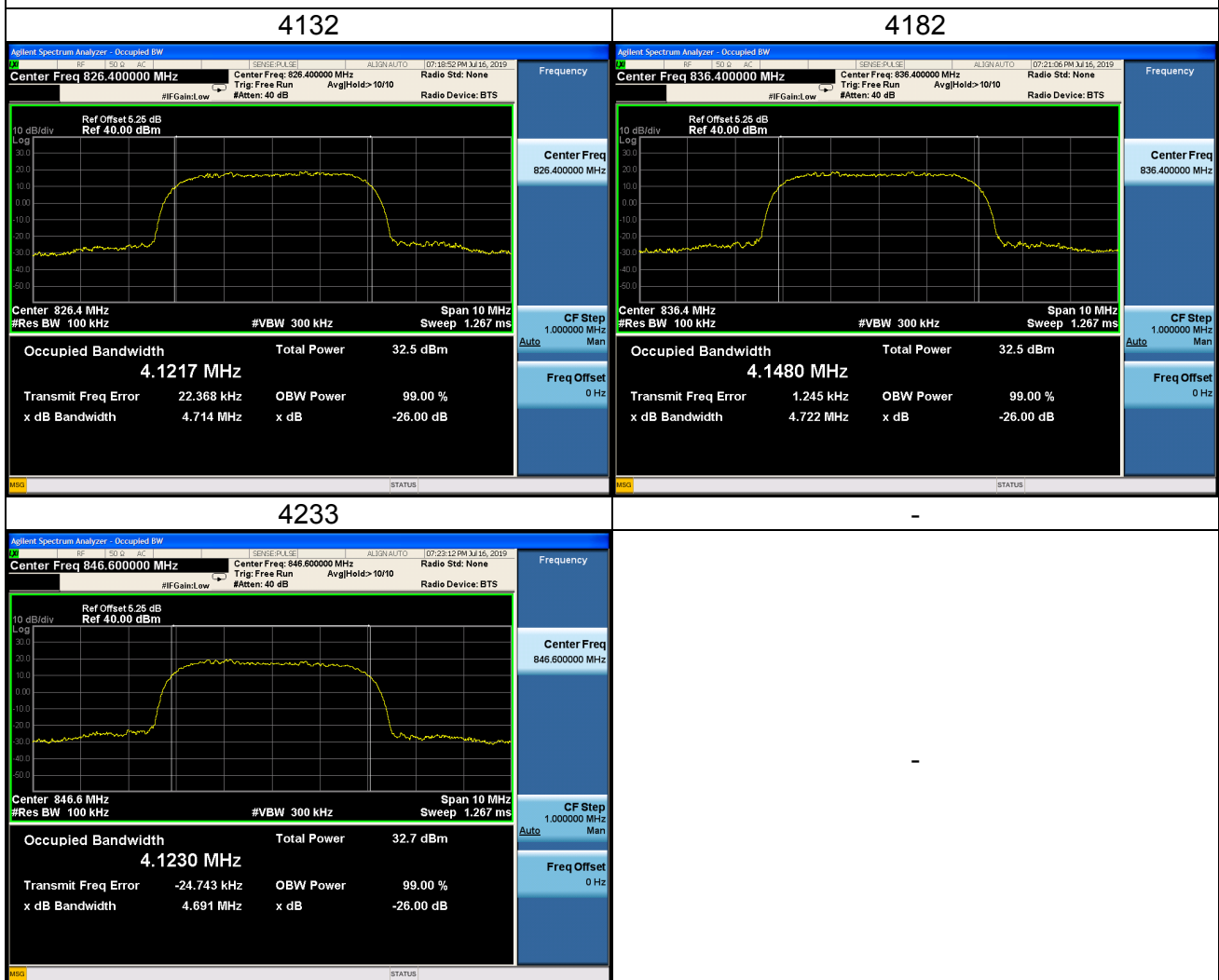


WCDMA_HSDPA Band V

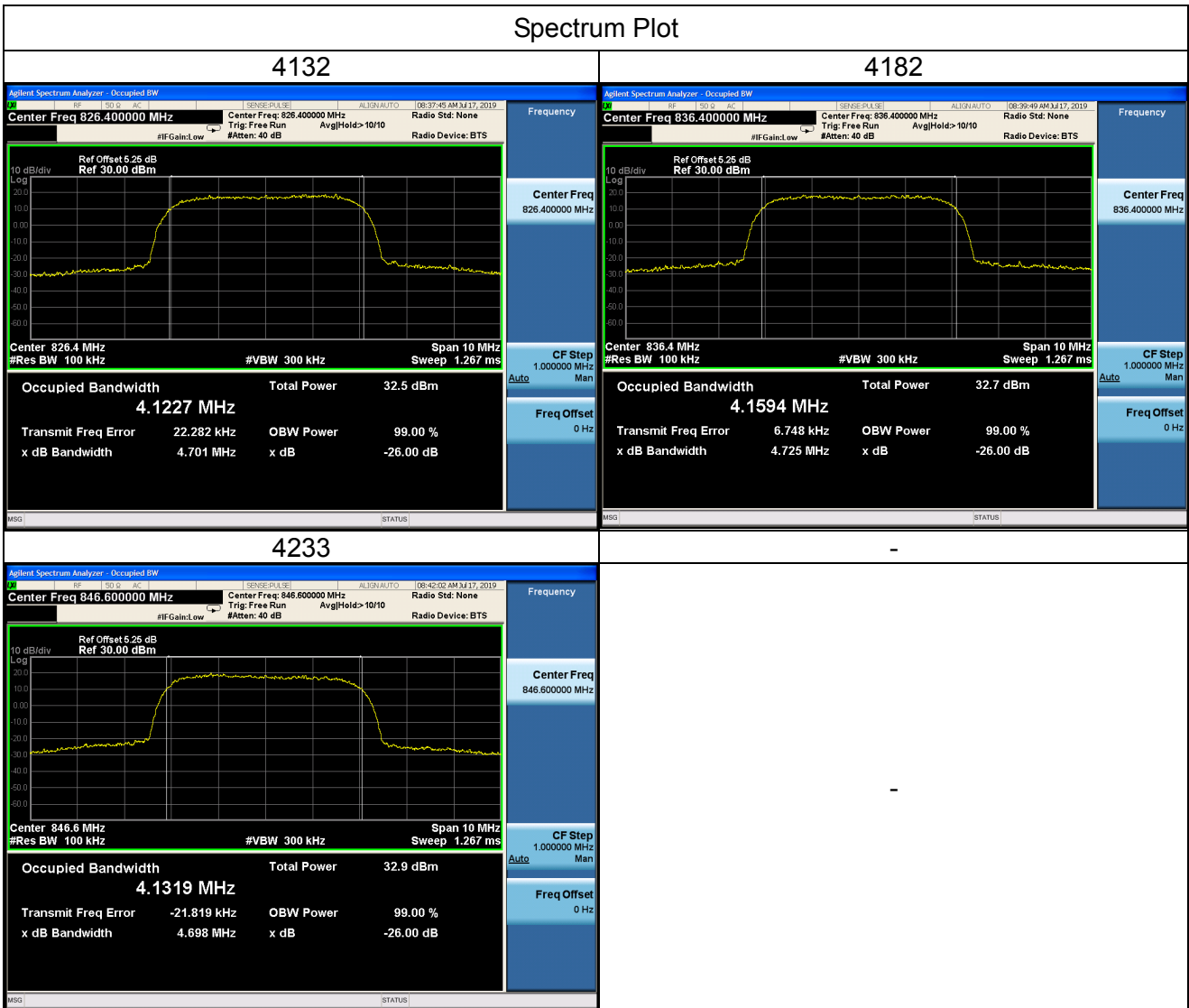
16QAM

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
4132	826.4	4.1217	4132	826.4	4.7140
4182	836.4	4.1480	4182	836.4	4.7220
4233	846.6	4.1230	4233	846.6	4.6910

Spectrum Plot



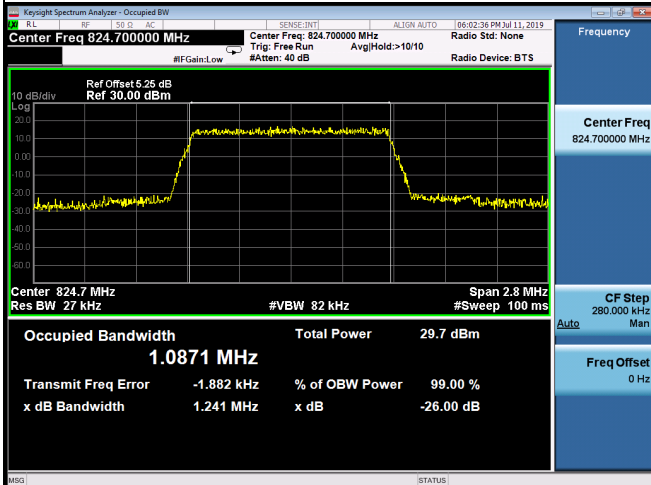
WCDMA_HSUPA Band V					
16QAM					
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
4132	826.4	4.1227	4132	826.4	4.7010
4182	836.4	4.1594	4182	836.4	4.7250
4233	846.6	4.1319	4233	846.6	4.6980



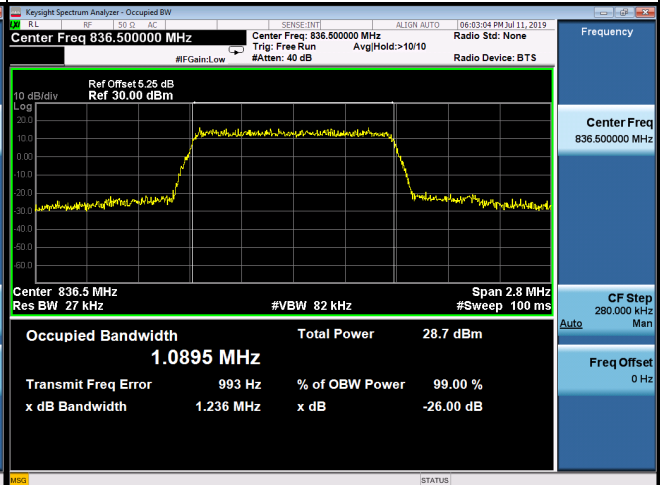
LTE Band 5_1.4M					
QPSK			16QAM		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
20407	824.7	1.0871	20407	824.7	1.0915
20525	836.5	1.0895	20525	836.5	1.0883
20643	848.3	1.0911	20643	848.3	1.0911
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20407	824.7	1.2410	20407	824.7	1.2340
20525	836.5	1.2360	20525	836.5	1.2370
20643	848.3	1.2260	20643	848.3	1.2470

Spectrum Plot

QPSK-20407



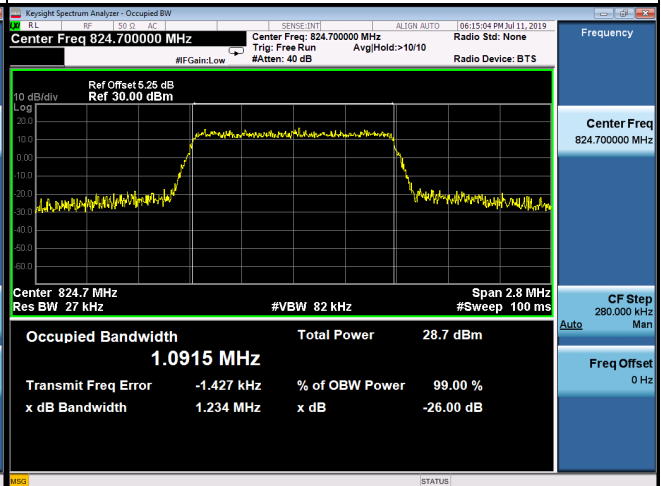
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QPSK-20643



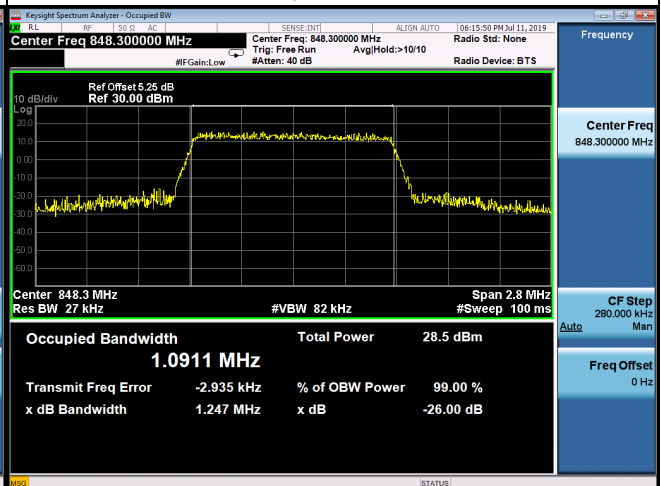
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16QAM-20525



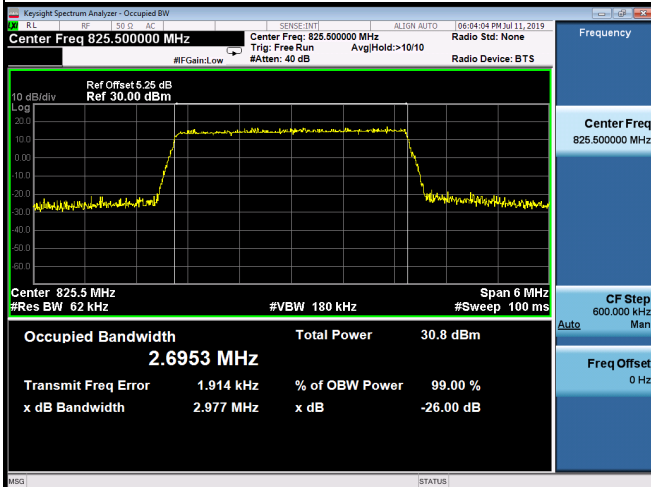
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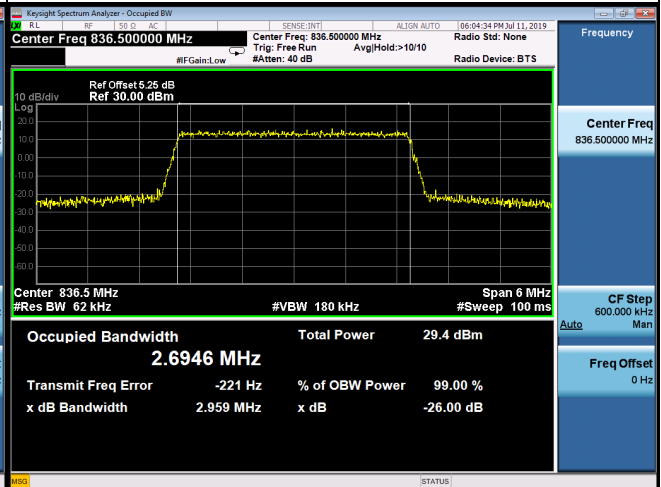
LTE Band 5_3M					
QPSK			16QAM		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
20415	825.5	2.6953	20415	825.5	2.7074
20525	836.5	2.6946	20525	836.5	2.6971
20635	847.5	2.6951	20635	847.5	2.7014
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20415	825.5	2.9770	20415	825.5	2.9780
20525	836.5	2.9590	20525	836.5	2.9640
20635	847.5	2.9440	20635	847.5	2.9500

Spectrum Plot

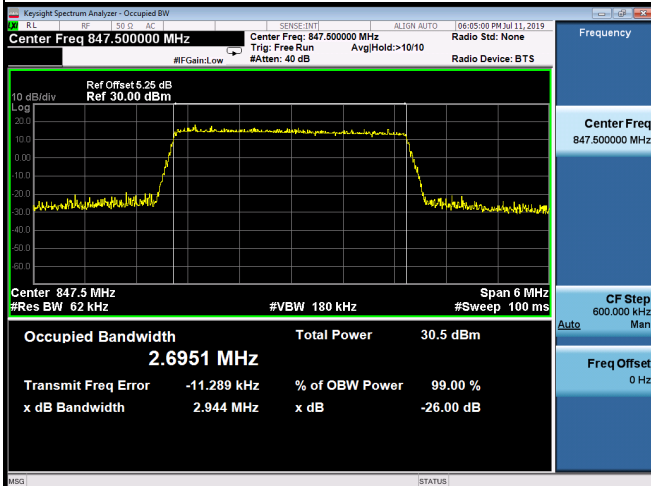
QPSK-20415



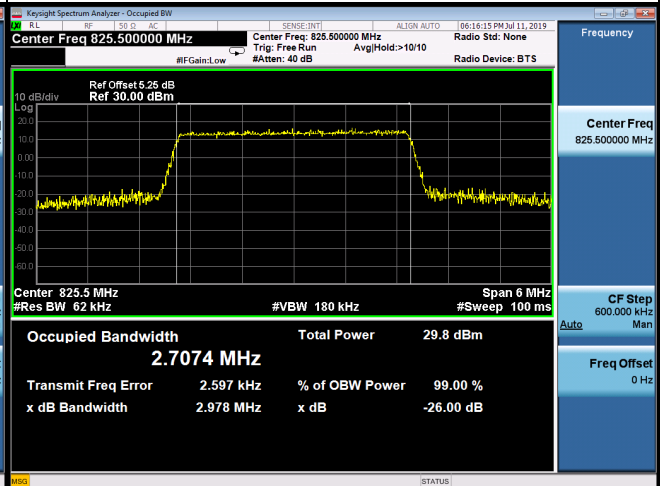
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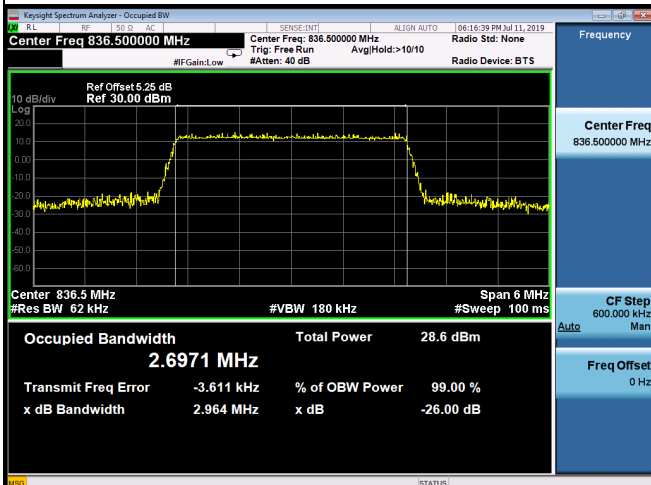
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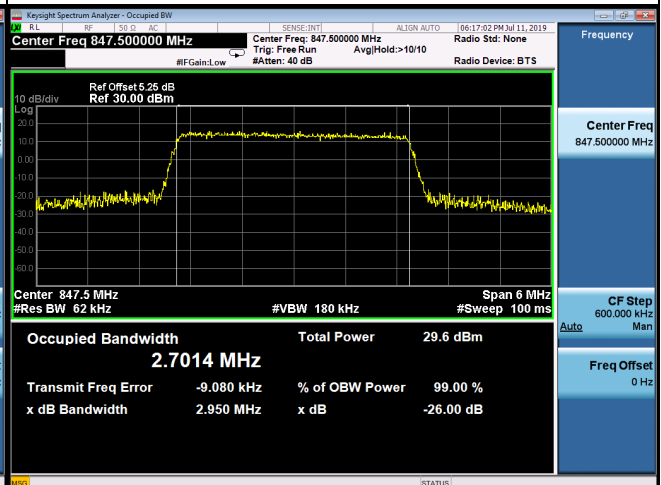
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16QAM-20525



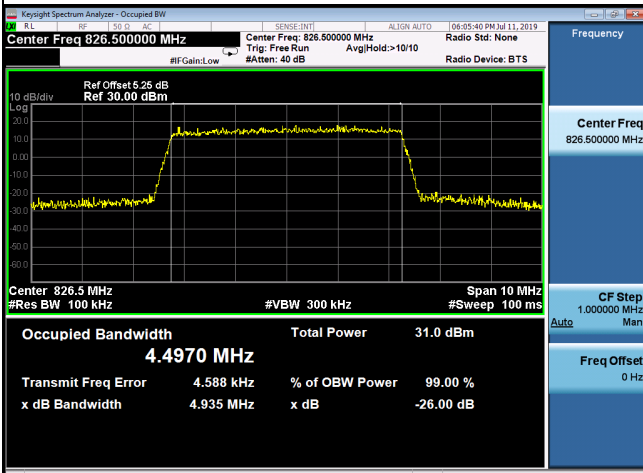
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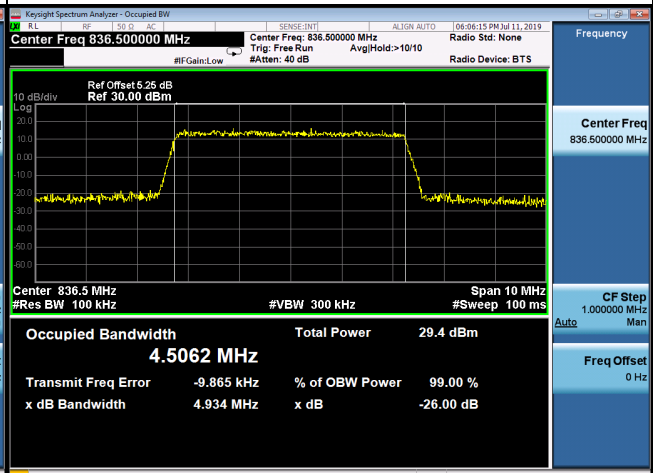
LTE Band 5_5M					
QPSK			16QAM		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
20425	826.5	4.4970	20425	826.5	4.5076
20525	836.5	4.5062	20525	836.5	4.5096
20625	846.5	4.4830	20625	846.5	4.5008
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20425	826.5	4.9350	20425	826.5	4.9500
20525	836.5	4.9340	20525	836.5	4.9410
20625	846.5	4.9230	20625	846.5	4.9290

Spectrum Plot

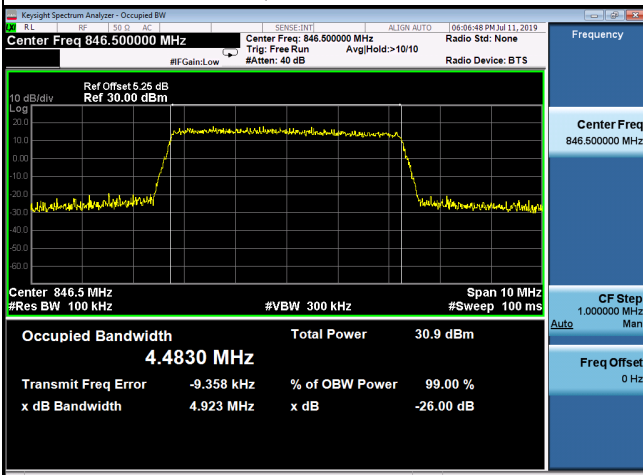
QPSK-20425



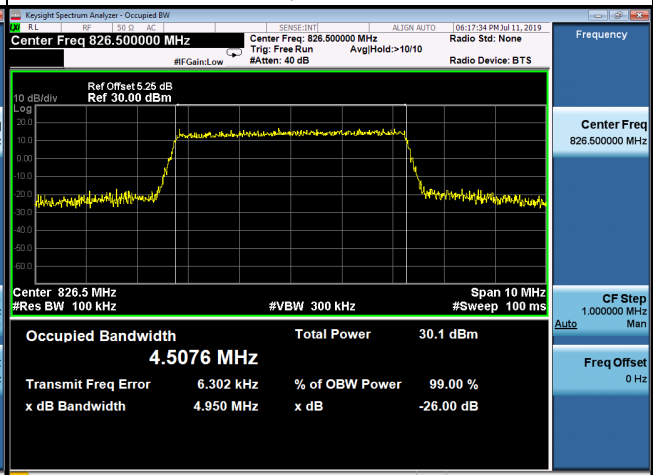
QPSK-20525



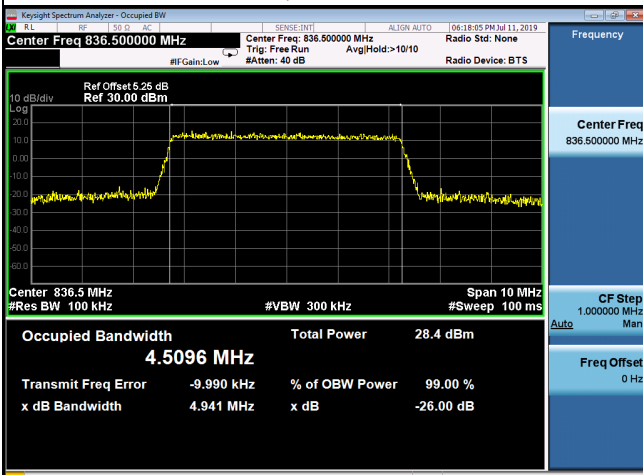
QPSK-20625



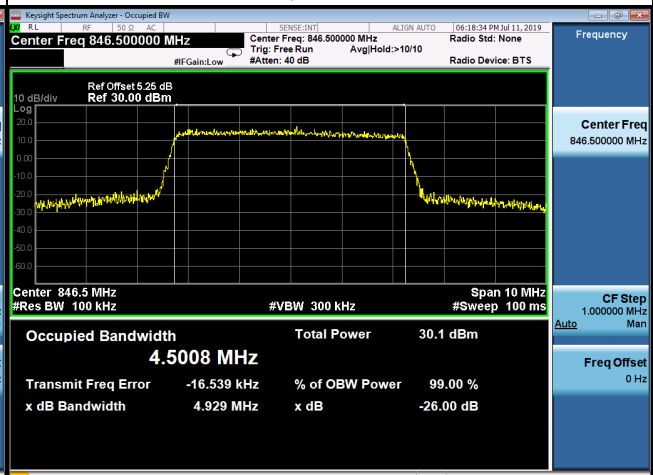
16QAM-20425



16QAM-20525



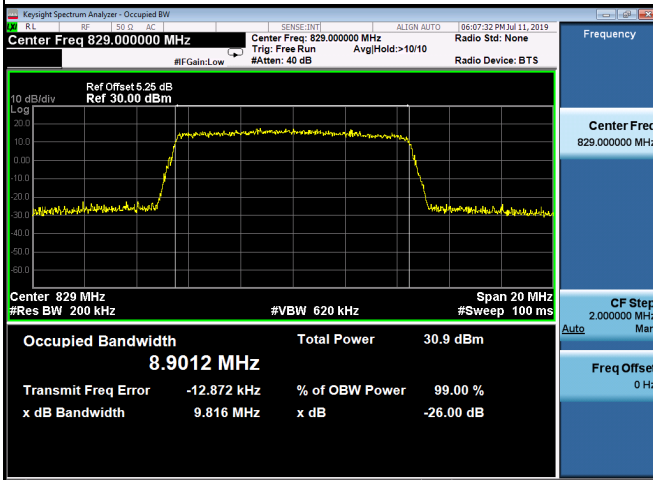
16QAM-20625



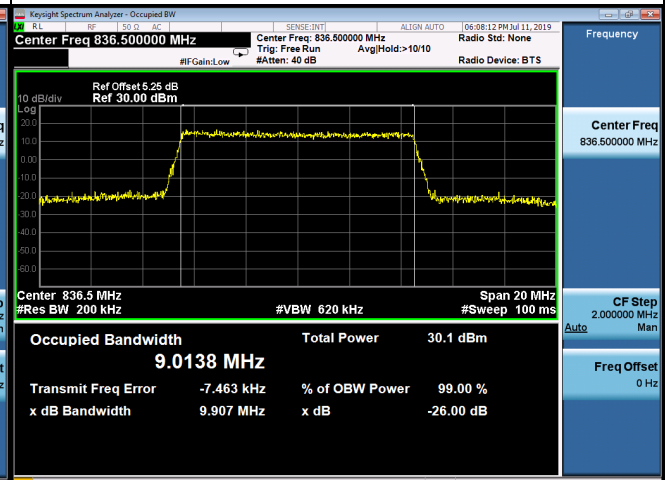
LTE Band 5_10M					
QPSK			16QAM		
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
20450	829.0	8.9012	20450	829.0	8.9132
20525	836.5	9.0138	20525	836.5	9.0277
20600	844.0	8.9203	20600	844.0	8.8852
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	Channel	Frequency (MHz)	26dB Bandwidth (MHz)
20450	829.0	9.8160	20450	829.0	9.7770
20525	836.5	9.9070	20525	836.5	9.9190
20600	844.0	9.7830	20600	844.0	9.7750

Spectrum Plot

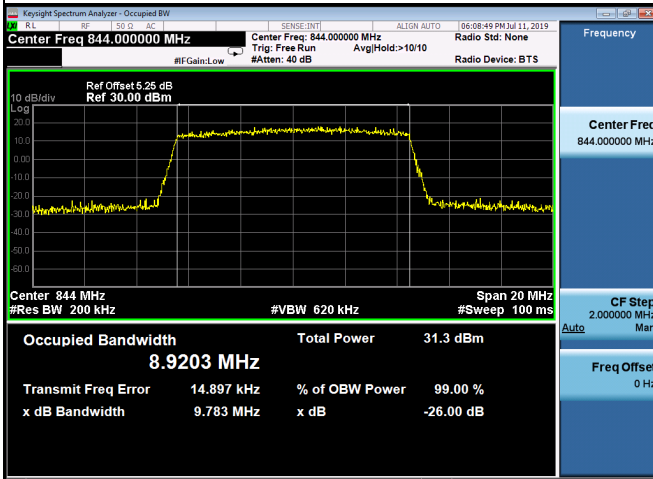
QPSK-20450



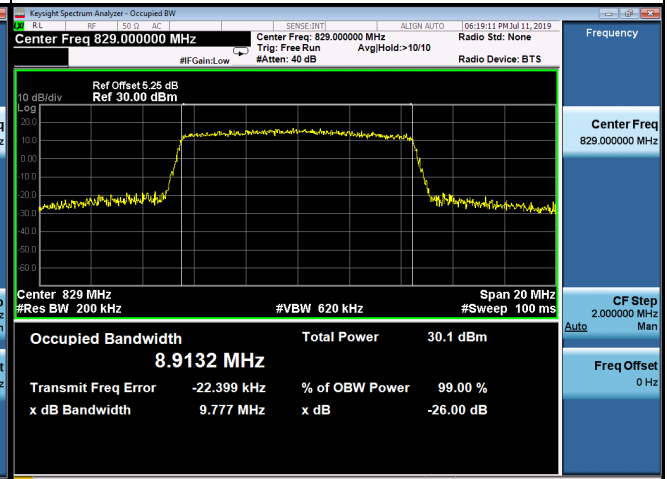
QPSK-20525



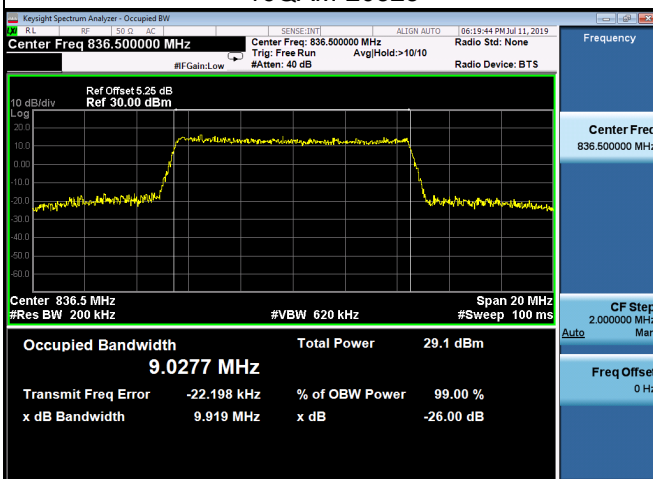
QPSK-20600



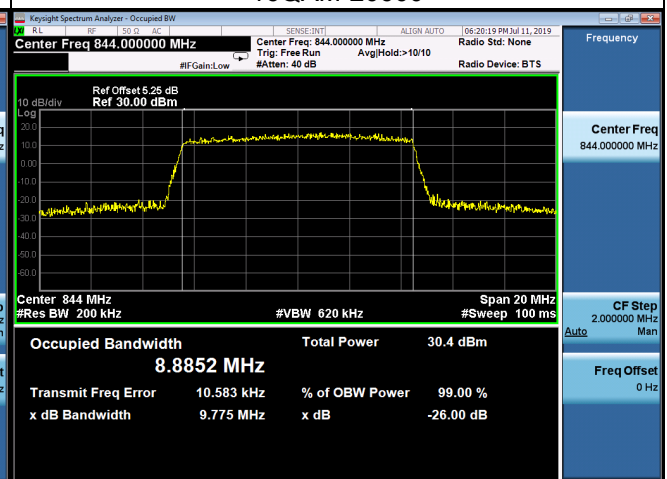
16QAM-20450



16QAM-20525



16QAM-20600



APPENDIX C - CONDUCTED EMISSIONS

GSM850			
GSM		GSM	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
190	836.6	190	836.6
GSM		EDGE	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
190	836.6	190	836.6
EDGE		EDGE	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
190	836.6	190	836.6

WCDMA Band V

Channel	Frequency(MHz)	Channel	Frequency(MHz)
4182	836.4	4182	836.4
Channel	Frequency(MHz)	-	-
4182	836.4	-	-
		-	

LTE Band 5_1.4M

Channel	Frequency(MHz)	Channel	Frequency(MHz)
20525	836.5	20525	836.5
Channel	Frequency(MHz)	-	-
20525	836.5	-	-
		-	

LTE Band 5_5M

Channel	Frequency(MHz)	Channel	Frequency(MHz)
20525	836.5	20525	836.5
Channel	Frequency(MHz)	-	-
20525	836.5	-	-
		-	

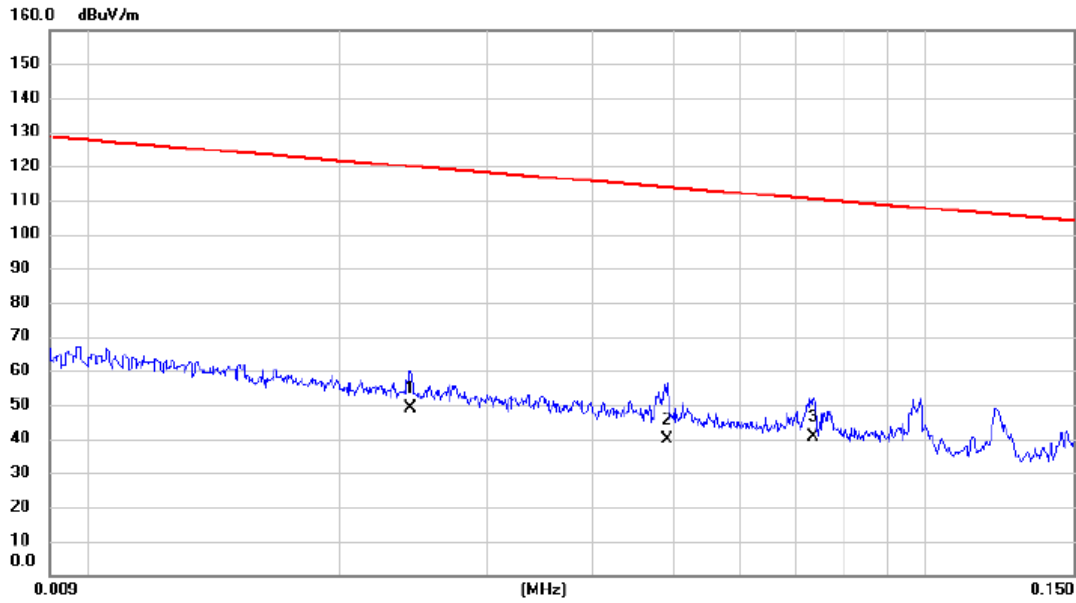
LTE Band 5_10M

Channel	Frequency(MHz)	Channel	Frequency(MHz)
20525	836.5	20525	836.5
Channel	Frequency(MHz)	-	-
20525	836.5	-	-

APPENDIX D - RADIATED EMISSION (9KHZ TO 30MHZ)

Test Mode: TX Mode

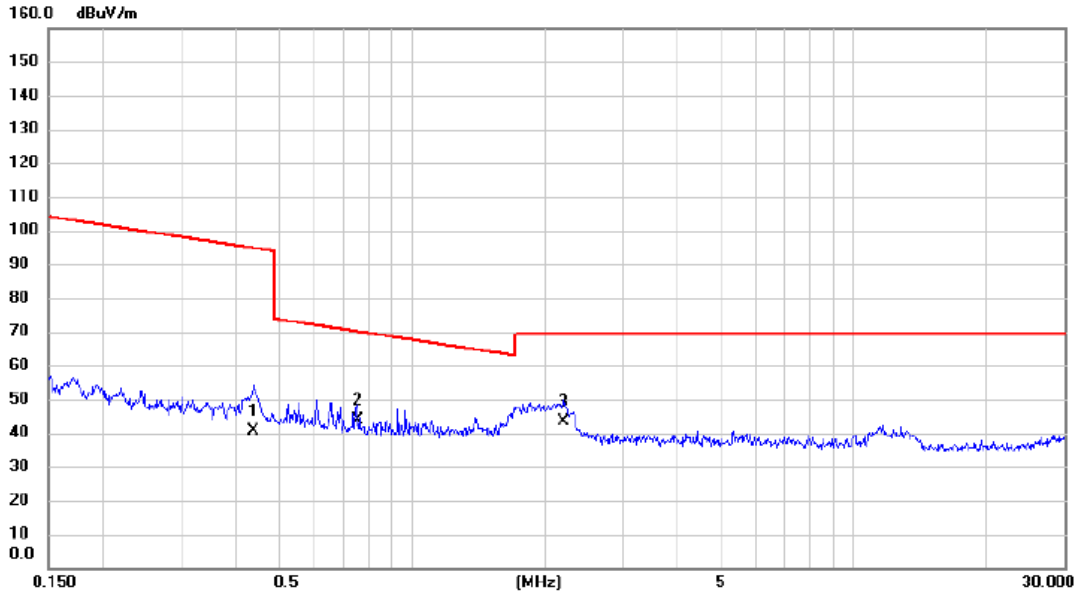
Ant 0°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.0243	35.00	13.83	48.83	119.89	-71.06	AVG	
2		0.0492	25.80	13.93	39.73	113.77	-74.04	AVG	
3	*	0.0734	26.90	13.56	40.46	110.29	-69.83	AVG	

Test Mode: TX Mode

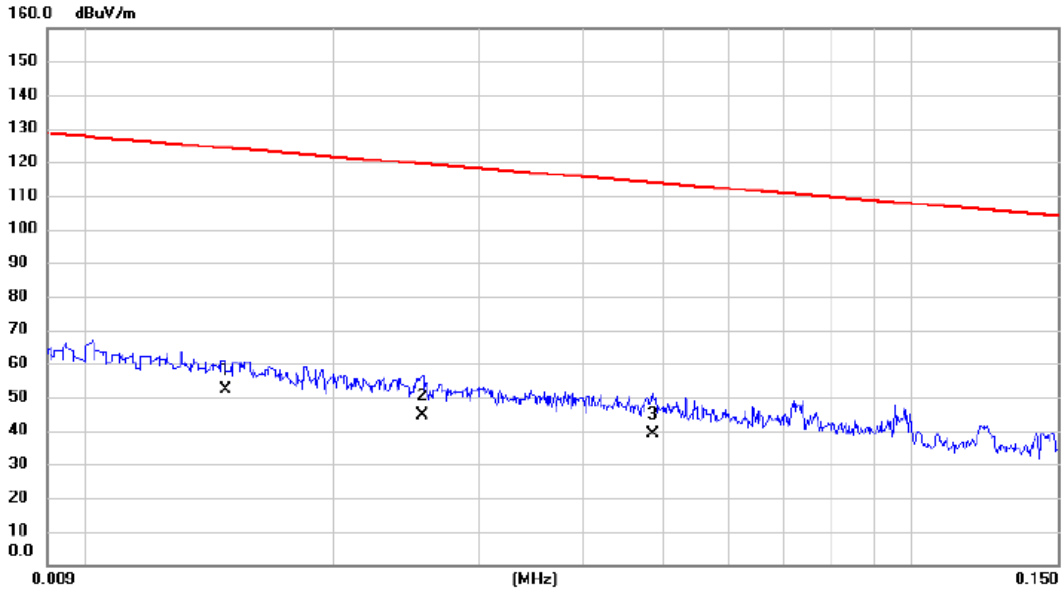
Ant 0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		0.4374	27.30	13.21	40.51	94.79	-54.28	AVG	
2		0.7510	31.40	12.58	43.98	70.09	-26.11	QP	
3	*	2.2131	31.90	11.69	43.59	69.54	-25.95	QP	

Test Mode: TX Mode

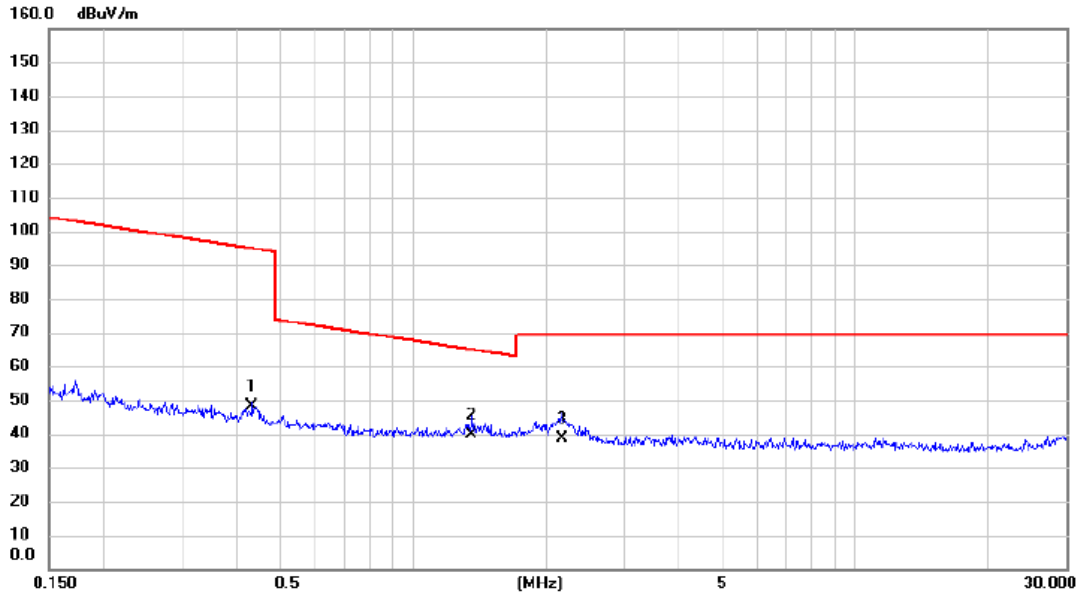
Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	0.0148	36.80	15.38	52.18	124.20	-72.02	AVG	
2		0.0256	30.70	13.84	44.54	119.44	-74.90	AVG	
3		0.0485	25.10	13.92	39.02	113.89	-74.87	AVG	

Test Mode: TX Mode

Ant 90°



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		0.4328	34.80	13.22	48.02	94.88	-46.86	AVG	
2	*	1.3593	27.60	12.26	39.86	64.94	-25.08	QP	
3		2.1668	27.00	11.72	38.72	69.54	-30.82	QP	